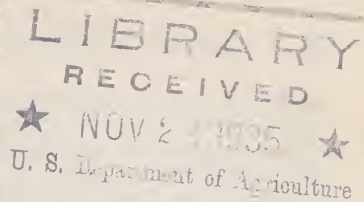


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REPORT OF THE CHIEF OF THE BUREAU OF HOME ECONOMICS, 1935

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF HOME ECONOMICS,
Washington, D. C., August 31, 1935.

HON. HENRY A. WALLACE,
Secretary of Agriculture.

DEAR MR. SECRETARY: I present you herewith the report of the Bureau of Home Economics for the fiscal year ended June 30, 1935.

LOUISE STANLEY, *Chief.*

The fundamental principle that consumption is the end and purpose of production has been reemphasized during the past 2 years and, as a consequence, the consumers' stake in public policy has been stressed. This point of view has given additional significance to the work of the Bureau of Home Economics. Not only has the importance of studies of consumption been emphasized, but the relation of these studies to national planning has gained wider recognition. If production is to meet consumer needs, the studies of this Bureau are basic in showing what should be produced, the qualities demanded in the commodities and the materials developed from them, and the amounts necessary to supply consumer needs. While in the past consumer use has been a check on production, planned production, based on consumer need, and forecasts of probable consumer demand are now suggested as providing a closer fit between production and consumption, with greater return to producers and greater satisfaction to consumers.

The basic purpose of the Bureau's program is to raise national levels of living by encouraging more effective consumption. The Bureau helps individuals and families to improve their consumption practices, in some cases having direct contacts, as through providing research findings and other material to educational and welfare agencies. It also furnishes information concerning consumers and the consumption value of goods and services for producers to use in planning their production programs to more nearly meet consumers' needs and preferences, and for governmental and other agencies to use in formulating social policies relating to consumption.

In order to supply the basic data for estimating probable consumer requirements, considerable time has been spent during the past year in planning a large scale study of consumer expenditures at different income levels. To coordinate the plans for the consumption studies of this Bureau with plans of other Government agencies, the chief of our Economics Division has been assigned for the past 3 months to the Central Statistical Board to work with a coordinating committee of the National Resources Committee. The plans for a consumption study have been worked out in some detail so as to furnish a comprehensive picture of the current requirements of the consumers of this country. This study has been proposed as a Works Progress Administration project.

But this is not enough. Insofar as consumer requirements can be measured in terms of desirability, it is important to think of the production of goods needed as well as those demanded. Studies are made by the subject-matter Divisions of the Bureau—Foods, Clothing and Textiles, and Household Equipment—to determine the qualities in ultimate-consumer goods contributing the most to consumer satisfaction. The Economics Division shows how the goods

and services available can be combined best to meet the needs of families of varying composition and income.

In the field of food commodities, considerable headway has been made in this. Nutrition studies of the Bureau have been directed to show by diet patterns how families of various sizes should select their food to meet, at different cost levels, current food habits and the demands for good nutrition. During the past year adaptations of these patterns have been worked out for use where particular food crops are especially abundant.

Such food plans are necessarily drawn in broad, general lines. The detail must be filled in with many small special studies, which, however, take on a new significance when viewed as a part of the whole. The importance of small things in nutrition—such as vitamins and traces of mineral elements—makes much detailed research necessary and ties the human-nutrition studies in rather closely with the scientific studies of the various production bureaus.

Composition of food varies with the soil and other cultural conditions. Certain soils produce foods toxic to animals and also to humans. In some areas the soil conditions are such that foods grown there are deficient in specific mineral elements, as for example, copper and iron, essential for hemoglobin formation, with the result that a high percentage of anemia is found in the children fed too exclusively on foods grown in these areas. Although problems such as these would probably yield to fertilizer treatment, food-composition studies help to show where such treatment is necessary, and by cooperative effort the condition can be corrected with considerable advantage to public health.

If economic planning is to help forward a more abundant life, it is of first importance to know the essentials for good living. Basic to life itself is health. Physiologists, nutritionists, and clinicians are showing the close relation between the kind of food we eat and health. In planning food production the United States Department of Agriculture, while mainly concerned with production plans which will be economically most profitable to the farmers, has a still greater responsibility for the protection of national health. It is important that food production be planned with the requirements of national health in mind.

FOODS AND NUTRITION

For convenience the research work on foods and nutrition is organized in three sections: (1) Food composition, summarizing available information on chemical constituents of different foods; (2) nutrition studies, with special reference to the presence and significance of vitamins and minerals in human nutrition; and (3) food utilization, studying the quality and uses of foods and the influence of conditions of production upon the quality.

FOOD COMPOSITION

Interest in the nutritive value of various food crops has been much heightened by the economic situation and by actual and proposed changes in the use of the land. The Food Composition Section of the Bureau has been able to make an important contribution to the subject through a large fund of information on the chemical composition of foods that has been accumulated from many authentic sources. This compilation has enabled us to supply information on food values to many agencies and individuals that are faced with food-selection problems or with problems of producing or processing foods.

On careful examination of the findings thus brought together it has become evident that available data are inadequate to show the influence of soils and soil treatment on the mineral content of foods. Since this influence of soils is a matter of first importance to agriculture, the need for further analytical work, under a unified plan, has been brought to the attention of various laboratories that are equipped to cooperate. Several of these have initiated new studies, at our instigation, and some have already sent in partial reports on completed portions of the work. The Bureau of Home Economics serves as a coordinating agency and is making plans to extend this cooperative project. Two studies have been conducted in cooperation with the American Dietetic Association. The first, a system of grouping fruits and vegetables according to their carbohydrate content, which had been prepared in tentative form, has been perfected and published after further trial in hospital practice had shown it to be adaptable and satisfactory. It is being widely used, since it

provides a uniform system of classification and one which reduces errors in computing diabetic and other special diets.

The second study, undertaken to meet the further demand of hospitals and social agencies, will attempt to provide a more satisfactory means of estimating the composition of cooked meats as served in hospital or home diets. Cooked meats are being judged and analyzed chemically to test the validity of a proposed scheme of classification for this particular purpose. The preliminary analyses made by the Food Utilization Section indicate that satisfactory results can be expected but show the need for a modification of the first draft of the plan. Accordingly, hospital laboratories that are taking part in the study will make the necessary adjustments as their work continues, reporting progress periodically.

NUTRITION STUDIES

Research in our nutrition laboratories is directed especially to the vitamin and mineral content of foods and the physiological effects of those food substances on the human body. Present-day knowledge of vitamins is far from complete, particularly as to the relative value of different foods known to contain them. During the past year the Nutrition Section has been engaged in translating into quantitative units the vitamin data already available and summarized. This material is being prepared for printing. Meanwhile a digest of it has been mimeographed for the use of dietitians and others interested in diet planning.

In the course of making this compilation it became evident that there was wide variation among authorities as to the vitamin C content of oranges and tomatoes. At the same time an unusual prevalence of scurvy among young children was reported from several large cities. As the citrus fruits and tomatoes are considered the best antiscorbutic foods, particularly for children, experiments were at once undertaken in our laboratories to recheck the current findings as to the relative vitamin C values of orange juice and tomato juice. The study will continue over a period of at least a year in order that different varieties may be studied, as well as the effects of different conditions of production and different methods of canning and storing on the vitamin C content of these juices.

In cooperation with the Bureau of Plant Industry this Bureau has studied the vitamin A content of tomatoes of different colors. The yellow variety contained slightly more than 1 Sherman unit and slightly less than 1 international unit of vitamin A per gram. The Red Marglobe (yellow skin) showed somewhat more than 8 Sherman units and approximately 8 international units per gram. The Gulf State Market variety (transparent skin) was considerably richer in vitamin A than any other variety, assaying almost 16 Sherman units per gram. Practically no vitamin A was found in the white tomato studied.

During the last 4 years a project has been under way to determine the vitamin A content of a yellow-fleshed potato. This variety, known as "Golden", was obtained by the Bureau of Plant Industry from a series of crosses between yellow-fleshed and white varieties in an effort to obtain a potato of high vitamin A content. This potato was compared with samples of the white Green Mountain and Irish Cobbler, an unnamed yellow-flesh seedling resulting from a cross of a yellow with a white variety, and a yellow potato similar to the original potato used in deriving the Golden. The original yellow potato, steamed, assayed about 100 units of vitamin A per 100 grams of fresh material. The white potatoes and the unnamed yellow seedling gave something over 20 units per 100 grams, while Golden was the poorest of the lot, assaying approximately 20 units per 100 grams.

Escarole has been credited with a vitamin A content so far above any other green vegetable for which data were available that a check was made in our laboratory. Tests of green outer leaves indicated 100 Sherman units of vitamin A per gram and about 125 international units. This value is about one-half that previously reported. The green outer portion of the leaf, i. e., that part left after the stem was removed, assayed about 150 Sherman units per gram.

The vitamin A rating of canned salmon of different species and also their content of vitamins D and G were checked in our laboratory in response to requests from relief workers, to whom large quantities of canned salmon were consigned. The vitamin A content was found to vary in the different species. Of these samples, red salmon was richest in vitamin A, Chinook was next, then pink, and lastly chum. Two brands of each species were tested, and the

samples were prepared by draining off the liquid and removing the skin and bones. Canned salmon is a valuable source of vitamin D and contains considerable amounts of vitamin G.

Tests are under way to determine the vitamin content of three kinds of nuts—almonds, filberts, and walnuts. In order to comply with demands for emergency work, our important spectrographic study of trace minerals in natural foods was interrupted during the past year. It will be resumed with a study of the mineral content of eggs. We expect to establish a list of trace elements normally present in eggs and follow through any that may prove of significance in human nutrition.

FOOD UTILIZATION

A series of studies of cooking quality and palatability in foods as affected by conditions and methods of production has been in progress in the Food Utilization Section for several years. Meats of different kinds and several varieties of potato have been used in these experiments, and the leavening power of eggs has been studied to show its relation, if any, to the diet of the hens, their laying cycle, and the season of the year. Other work has included experiments to show how cooking technic influences the appearance, food value, and palatability of the product, and also the fuel requirements.

Much of the work in this Section was done in cooperation with the Bureaus of Animal Industry and Plant Industry, and also, where meat was concerned, with the Bureau of Agricultural Economics and State experiment stations. Meat-canning problems arising in relief canning centers were studied also, and jelly-making experiments were continued with a variety of fruit juices.

EGGS

The egg studies indicate that the diet of the hen has little, if any, effect upon the properties which give eggs the leavening power that is depended upon in such dishes as omelets, soufflés, sponge cake, etc. Nor does it appear from our experiments that this quality varies with the laying cycle of the hen or the season of the year. Fifty samples of eggs from hens receiving five different rations were studied from the beginning through 9 months of the laying cycle and during the fall, winter, spring, and part of the summer seasons. The studies included measurements of the hydrogen-ion concentration, total solids, carbon dioxide, refractive index, and viscosity of the eggs, and specific volume, compressibility, and tensile strength of sponge cakes made from the different samples of eggs.

MEAT

For the meat studies about 350 cuts of meat from experimental animals were cooked to determine their palatability as affected by the feed, sex, and age of the animals and the curing and storing methods used.

In the experiments with pork, the hogs were fed rations which differed in source but not in the proportion of protein. In one ration the protein was supplied by fresh skim milk, in another by dried skim milk, and in a third by tankage. In general, the meat from the hogs fed the fresh-milk ration was superior in palatability to that from the hogs fed the dried skim milk and the tankage rations. Differences were small, but the trend was consistent for the factors of tenderness, intensity and desirability of flavor of lean, desirability of flavor of fat, and richness of juice. The results are believed to justify further work to establish more definitely the possibilities of fresh skim milk in the production of high-quality pork.

In a comparison of meat from hogs which received a submaintenance ration of corn silage and clover hay and meat from hogs full-fed on a good ration, loins and half hams were tested. The meat from underfed hogs was found to be less desirable, both when it was judged as usual and when the judges were blindfolded. From the psychological angle, it was interesting to find that in studies on flavor detection less difference was detected between the desirability of meat from full-fed and that from underfed hogs when the judges tasted the meat without seeing it.

As part of the studies of lamb and mutton cured and stored for varying lengths of time, loins, legs weighing up to 6 pounds, and legs weighing more

than 6 pounds were cooked for palatability tests. On the whole, the results indicate that with the methods employed it is impracticable to store the cured loins, and that cured legs can be stored successfully for a short time, but that heavyweight legs were more palatable than lightweight legs. The fat of cured lamb and mutton, however, soon became rancid, presenting serious problems and confirming previous work.

In a series of experiments to show how cooking technic influences appearance, shrinkage, and palatability of meat and the fuel requirements of the oven and speed of cooking, comparisons were made between constant-oven-temperature roasting and methods which include an initial sear and a slow finish. The cuts used were standing and rolled ribs of beef cooked to the rare, medium, and well-done stages. These experiments round out a study on beef similar to that reported in Technical Bulletin 440, entitled "Shrinkage and Heat Penetration During the Roasting of Lamb and Mutton as Influenced by Carcass Grade, Ripening Period, and Cooking Method."

For the guidance of the housewife in preparing the leaner meat which was then found on the market in larger proportion than usual as a result of the drought, a pamphlet, Miscellaneous Publication 216, Meat Dishes at Low Cost, was prepared. This pamphlet gives the principles of cooking meat according to tenderness and fatness and includes 60 recipes for braised steaks and chops; pot roasts and stews; low-priced roasts; ground meat, sausage, and salt pork; left overs and canned meat; liver and other edible organs.

Because of the many requests for the exhibit entitled "What Temperature Roasting", shown at A Century of Progress in Chicago in 1933, enlarged photographs of the three beef roasts have been made. These photographs, mounted, with a brief description of the experiment, are available for loan to teachers and research workers.

POTATOES

The studies on potato quality were expanded to include two new investigations, the variation in cooking quality of one variety of potato within one field and the effect of maturity of potatoes on their cooking quality. About 30 seedling potatoes were tested for palatability for the purpose of determining varietal selection.

Several methods, including soaking in warm water and different solutions of sodium and calcium chloride and dextrin solutions, were used to free potato slices from the excess sugar found in the potato during storage at low temperatures. While several methods were successful in removing the sugar, other undesirable effects, such as blistering, poor flavor, and increase in oiliness offset the improvement in color. Reduction of the sugar in the potatoes by storing at high temperature for a short time was found to be the most desirable method of improving the color of the potato chip.

SOYBEANS

To demonstrate the palatability of soybeans as a green vegetable and to select varieties according to environment for production, 77 varieties of soybeans produced by the Bureau of Plant Industry were tested in our experimental kitchens. On the basis mainly of flavor rather than texture, about 20 percent of the varieties were rated excellent, 46 average, the remainder poor.

The quality of soybean milk derived from different varieties of soybeans and made by different methods was also studied in cooperation with the Bureau of Plant Industry. Of the common varieties of soybeans, Rokusun, Haberlandt, and Mammoth Yellow were found to be the most desirable for milk, and it was demonstrated that the soybean milk could be used in any recipes calling for milk. The mash left from making the milk had very little flavor, but it could be used in combination with food of more pronounced flavors to make loaves, soufflés, stuffings for vegetables, sandwich fillings, and to increase the volume and food value of simple cakes and quick breads.

By fermentation or by adding acid, a curd can be produced from the milk, and used in salads or rarebits and for sauces for rice, macaroni, hard-cooked or scrambled eggs, and other foods.

FATS

Study of the keeping and cooking qualities of different kinds of fat, begun 2 years ago, was continued. Chemical tests of 3 kettle-rendered and 1 prime

steam lard, 2 hydrogenated vegetable fats, and 3 vegetable oils made at intervals of 6 months during 1½ years of storage showed very little change in free fatty acid content and no marked increase in peroxide value. The samples were stored in containers of different type and size, in order to determine the effect, if any, of this factor on keeping quality.

After a year's storage, tests were made to determine the deterioration of odor and flavor. Among the hydrogenated fats no extreme differences were apparent. While approximately half of the samples had a moderately undesirable odor, none of the others scored lower than neutral or moderately desirable. The hydrogenated fats showed the most consistent high score, both for large and for small packages. The 3 kettle-rendered lards, the prime steam lard, and the corn and peanut oils showed the greatest deterioration.

At the end of a year and a half, the fats were used as shortening in biscuits and judged for taste and odor. Two of the kettle-rendered lards made from fat of hogs fed respectively on a peanut and a corn ration were most frequently marked by judges as stale or rancid. Cottonseed oil also scored low in flavor. The prime steam lard ranked among the best. The corn oil gave the most desirable flavor although the peroxide value was the highest of all the fats.

CANNING

Experience gained in the large-scale canning of drought-relief meats in 1934 makes it necessary to change our recommendations for the processing of home-canned meats. At the beginning of the emergency the processes used in relief canning were those then in common use. The canning was done under varied conditions of weather, sanitation, equipment, and with many inexperienced workers. It soon appeared, however, that heavier processes would be necessary to reduce spoilage. Laboratory tests showed that even the heavier processes do not always give actual sterilization, but they do destroy the botulinus bacteria, which might cause food poisoning, and other still more heat-resistant organisms which would be probable causes of spoilage under average conditions of storage.

To study the effect of the heavier processes on the quality of the canned meat, paired leg muscles from prime beef were canned by the heavy and the shorter processes. It was found that there was very little difference in the quality of the two products. Further studies are being made in which samples will be stored 6 to 8 months.

Since no regular laboratory inspection service was available for the examination of the meat products packed from drought-relief animals in Federal and State canning plants, samples of these products were sent in for examination. Over 500 cans of meat were examined for flavor, trim, color, odor, and tenderness. The meat was rated on the average as fair in quality, and wholesome, although lacking the finer flavor and tenderness found in meat canned from animals of good grade.

The number of community canning centers in operation over the country has increased during the past 2 years until there are now several thousand. In the smaller centers there has been much need for information on the handling of canning equipment. For this reason the mimeographed circular, Community Canning Centers, has been revised and enlarged with more detailed information on canning equipment and the process of canning in tin cans.

JELLY MAKING

Study of the jelly-making qualities of some of the more common fruits was continued for the fourth season. Work with blackberries, raspberries, crab apples, currants, grapes, and quinces gives additional evidence of variations in the fruits which influence their jelling properties. Measurements which show these variations are the specific gravity, viscosity, and acidity of the fruit juices and the gel strength of the jellies.

The fruit of an ornamental tree, *Dillenia indica*, grown in Puerto Rico, was tested as a possible source of commercial pectin. The fruit was found to contain very little—only 0.5 percent—of acid-extractable pectin. Storage studies showed that a temperature of 50° F. with 70 percent humidity, brought about very little change in the fruit over a period of 30 days.

TEXTILES AND CLOTHING

While the relation of clothing to health is not so direct as that of food, the expenditures for clothing and household textiles come next to food in many families, and the selection and care of these commodities are an important economic consideration to all consumers. Our Textile and Clothing Division studies the composition of textile fabrics with a view to setting up guides for the consumer in wise choice and use.

This Division has also made studies to show the relation between the grades of cotton and wool fibers and the consumer-use value of the fabrics made from these fibers and from these fibers mixed with others. These studies are important in adapting fiber production to consumer need and probable demand, as well as in evaluating the influence of production factors on quality as interpreted in consumer terms.

Economic conditions during the past few years have focussed particular attention upon consumer problems. Choices in the case of textiles and clothing are especially difficult because of the lack of buying guides such as grades, standards, or consumer specifications to help the ultimate consumer select these products intelligently. It is widely recognized that before a buyer can identify the true qualities of textile materials and thereby determine the one best suited to his needs, he must be supplied with definite information regarding the construction or performance in use of the articles from which he must make a selection. Otherwise he is completely at the mercy of the seller. His buying must be a haphazard, "by guess" method. This is also true of much of the buying of institutions that do not have testing laboratories at their disposal. It has been an outstanding difficulty of relief agencies attempting during the past few years to purchase clothing which would represent the best value at relief cost levels.

A second deterrent to intelligent selection and use of textiles is the lack of information as to the relative value of different raw fibers when put into goods for consumer use. At the present time no one knows the durability and desirability from other standpoints of different grades and varieties of fibers when woven into fabrics. No information is available on the effect of conditions of fiber growth and development upon the wearing qualities of finished materials.

The scarcity of data on the effect of various cleaning agents and cleaning processes on different textiles, especially those of recently developed synthetic fibers and finishes, is often another direct cause of loss of money to consumers. The garment made unwearable by laundering or dry cleaning is a common occurrence in many households and a significant drain on family resources.

These difficulties have an important bearing on the textile production of the country. It is impossible to build an intelligent agricultural program as far as textile production is concerned so long as there is no information available regarding the relative usefulness and probable demand for different varieties, grades, and kinds of fiber in consumer use. It is impossible to plan intelligently in the absence of basic scientific information regarding the serviceability and hygienic and other values of different materials and fabric constructions. In this time of great competition of one fiber with another, these matters take on added significance.

FABRIC COMPOSITION

In order to determine the characteristics of the merchandise from which consumers must now make a selection on the retail market, this Division is making physical and chemical analyses of representative qualities of staple textile articles. For example, 37 pairs of cotton Turkish towels, typical of the choice available to consumers during the spring and summer of 1934, were analyzed and the results published. Such physical properties as weave, type of yarn, yarn twist per inch, thread count, breaking strength, bursting strength, thickness, and water absorption were determined. The chemical condition of the cellulose was investigated by means of determinations of hydrogen-ion concentration, methylene blue absorption, fluidity in cuprammonium hydroxide, and copper-number tests.

In general all the towels tested could be classified in four groups or construction types according to thread count and ply of yarn. Type 1 might

include those towels having a single-ply ground warp with half as many ground as pile ends; type 2, those also having single-ply ground warps but an equal number of ground and pile yarns; type 3, those having two-ply ground warps with half as many ground as pile ends; and type 4, those having two-ply ground warps equal to the pile yarns in number. The physical properties tended to group into these classifications, as follows:

Type 1 towels were considerably weaker than any of the others, for bursting as well as breaking strengths. Those having two-ply ground warps and more yarns per inch were stronger, but the rate of water absorption was slower. For example, when the values were averaged for the four types of construction, the water absorption of type 4 was found to be lower than that of the other three. In this connection it should be noted, however, that rate of absorption as measured by the method used does not take into account the total water held. Type 4 would no doubt be high in total water absorbed.

Additional towels are being analyzed, and the study will be continued until sufficient data are available for the setting up of quality grading systems or other types of consumer buying guides.

A similar study was made of 44 representative household and camp blankets purchased during the spring and fall of 1934. These were analyzed for weave, type, and kind of yarn, thread count, yarn twist per inch, breaking strength, fiber composition, weight, thickness, heat transmission, air permeability, fiber-length distribution, fineness of fiber, bursting strength, and resistance to abrasion. The results showed that there is a very wide variation in the physical properties of blankets now on the market and emphasized the need of informative labels giving facts which could be used by purchasers as buying guides. For example, some blankets were 12 times as strong as others, a few having a tensile strength fillingwise of less than 3 pounds (strip method).

The bursting strength ranged from 29 pounds for one all-cotton blanket to 142 pounds for an all-wool one. Warmth also varied widely. In general, the thicker the blanket the warmer, but there was no direct correlation between thickness and warmth. The all-wool blankets weighed from 8.4 to 14.9 ounces per square yard, the wool-and-cotton ones from 6.9 to 14.7, and the all-cotton from 4.6 to 11.1 ounces. All other factors being equal, the lightest weight blanket would be the most desirable. However, reducing the weight may also reduce the warmth and durability. In the blankets tested, the all-wool ones showed either a low filling breaking strength or a high heat transmission and a high air permeability for those with weights below 13 ounces per square yard.

No one blanket analyzed was consistently high or low in all properties. As far as indicated by this study, it is necessary for a purchaser to select blankets that have one outstanding quality such as warmth or light weight and still meet certain minimum requirements in other properties such as thickness and tensile strength.

SERVICE TESTS OF TEXTILE FABRICS

At present practically no studies have been made to show the relation of construction and composition of textile materials to serviceability. It is therefore impossible to advise consumers as to what serviceability can be expected from a fabric of a given construction or composition. The Bureau has made a beginning on this type of study. For example, serviceability tests on Turkish towels of different constructions are now under way. Work of this kind has also been coordinated with other research dealing with the serviceability in consumer use of various kinds and grades of fibers in which the Department is interested from a production standpoint.

A service study on blankets made from various combinations of fine, one-half blood, three-eighths blood, one-fourth blood, and reworked wool has been made in cooperation with the Bureau of Animal Industry. This is almost completed, and the results are being prepared for publication. The effect of wear and laundering on these blankets has been compared with that of laundering alone. The resistance to bacterial action of the different kinds of blankets when new and after different periods of wear has been studied with the aid of a buffered trypsin solution and the progressive deterioration with service recorded by photomicrographs of the treated fibers. Although service produced no measurable change in the cystine content of the wool, the sulphur content was found to decrease slightly. The oxygen-bomb method for determining sulphur was compared with the Benedict-Denis method, and found to give more accurate results. None of the blankets contained sulphate sulphur.

Another group of blankets composed of three-eighths-blood wool, reworked wool, and mohair have been woven, and their serviceability is also being determined. A study of the comparative use-value of sheetings made of cottons grown under irrigated and nonirrigated conditions is nearing completion.

BUYING GUIDES FOR CLOTHING AND HOUSEHOLD TEXTILES

The material on clothing and household textiles, which is available, is being compiled in a series of buying-guide leaflets. This now includes the titles: "Quality Guides in Buying Ready-made Dresses," "Buying Guides for Costume Slips," "Buying Bedspreads," "Quality Guides in Buying Household Blankets," and "Quality Guides in Buying Sheets and Pillowcases."

CARE OF HOUSEHOLD TEXTILES

Studies relating to the household care of textiles have been restricted this year to an investigation of the effect of ironing upon sheeting fabrics composed of known cottons. A paper reporting the chemical and physical changes in such fabrics produced by applied ironing pressures has been prepared for publication. In general an increase in temperature was found to be more damaging than the same percentage increase in pressure.

At both high and low pressures first changes in color, as measured by surface reflectance, occurred at least 130 Fahrenheit degrees lower than first changes in breaking strength. Reflectance curves for fabrics from Good Middling, Middling, and Strict Good Ordinary cottons tend to be almost identical with increasing deterioration of the ironed cotton. An increase in pressure from 1 to 4 pounds per square inch with a household ironer of the roll type produced a measureable stretching of fabrics in the direction of motion. Since no corresponding shrinkage at right angles to the motion was obtained, a more open weave would be developed with repeated ironings at high pressures, which would obviously reduce the resistance of the material to wear and laundering. This effect on the fabric was not noted for the same pressure change when there was merely still contact with the heated metal.

Experimental results showed the resiliency of a padding to be very essential. The nature of the padding exerted much more influence at low pressures than at high. When a hard, unyielding material was used at pressures from 1 to 1½ pounds per square inch, damage was increased as much as 50 percent of the value obtained with normal padding.

Data on the effect of time of contact with an ironing surface are being prepared for publication. The period of contact for most of these observations varied in range from 1 to 60 seconds. At a temperature as low as 220° F. and a pressure of 1¼ pounds per square inch, a contact of 12 minutes produced only slight indications of scorch.

In the course of the ironing studies it has been found that damaged samples showing only a small change in breaking strength were very much weaker after a laundering process. Used cotton fabrics which had been washed 175 times in water containing only a moderate degree of hardness gave much less change in color with ironing if they were previously given a treatment with sodium meta- and pyro-phosphates. Since this treatment removed lime and magnesium soap, it is probable that continued inadequacy of rinsing is responsible for relatively large color changes previously observed for used materials.

The mimeographed circular, Home Dyeing With Natural Dyes, has been in such great demand that further study was made on this subject. Various methods of mordanting and additional dye materials were investigated. More exact recipes than had hitherto been published were developed. The results of this work have been reported in a manuscript accepted for printing in the Miscellaneous Publication series of the Department.

A series of seven charts showing the use of natural dyes in handicraft work has been made. These are lent for use in extension and other classes interested in craft work.

CLOTHING DESIGNS

In addition to the projects on the purchasing of clothing, most of the work of the Division on clothing construction and design has been related to the emergency situation. However, the four traveling exhibits of recommended designs and materials for infants', creeping babies', and preschool children's clothes have continued to be used all over the country. In addition to the

purpose for which they were originally planned, they are now proving valuable as standards of construction. This aspect of clothing education is being stressed by supervisors of relief rooms and by home economists in an effort to teach value in ready-made clothes as well as in those made in the home. Mimeographed circulars illustrating and describing new playsuit designs for both summer and winter have been issued.

To supplement the two traveling exhibits of clothes made from used materials, ways have been worked out for using materials and cast-off articles of apparel that have heretofore not been considered usable. These exhibits have proved particularly useful in self-help and emergency sewing schools and relief workrooms all over the country.

HOUSING AND EQUIPMENT STUDIES

Government housing projects now under way have increased the demands upon the Bureau for advice in house planning from the standpoint of the housekeeper. Kitchen arrangements in particular, and tests of such large pieces of equipment as stoves and refrigerators, are the concern of one section of the staff. This work, carried on in the interest of efficient operation of the household with the greatest convenience to the housekeeper, is intended to furnish guides to the architect or builder of the house and to the manufacturer of household equipment, as well as to the purchaser.

To test the adequacy and convenience of kitchens planned for rural housing, and to illustrate the principles of convenient arrangement for different types of kitchens, a method has been developed of building models of kitchens, completely equipped, in miniature. This has in some cases shown up faults in the architect's plans, and has proved a useful and economical way of checking those plans. It also offers illustrative material for educational and publicity purposes.

In connection with this study of kitchen arrangement, work has also been done in cooperation with the Department of Interior in standardizing the equipment and planning the arrangement of kitchens for different-sized families for slum-clearance projects under the Public Works Administration.

This work demonstrated the importance of establishing standards of convenience and adequacy for the kitchen and its equipment. For economy in building costs, as well as convenience of the housekeeper, such standards should be applied by the architect in drawing the original plans.

In general, the tests of electric stoves showed that enclosed speed units are more desirable for surface-heating elements than the open units. They are faster than open units, some of them taking only half the time required by open units of the same wattage. Because of their greater efficiency, they consume only from two-thirds to three-fourths as much energy as the open units. While the initial cost of the enclosed units is more, this greater speed, lower cost of operating, and their much longer life indicate greater economy in the long run.

For greater efficiency and economy in the use of electric stoves, however, there is need of more attention to the designing, as well as selection, of cooking utensils especially adapted for use on electric heating elements.

The laboratory tests of electric ovens show wide variations in temperature in different parts of the same oven at the same time, and a wide variation in the energy and time consumed by the different ovens in the preheating of the oven and the baking processes. For example, one oven with top and bottom heating elements took less time and less energy in preheating through a range of temperatures from 200° to 600° F., and in baking, than an oven which had only one heating element. The first one also produced more satisfactory baking. This is markedly influenced by the type and amount of insulation.

As compared with electric ranges, small separate pieces of electrical cooking equipment proved more efficient and economical for low-cost housing in rural sections. But tests of some of the very cheap hot plates on the market today show them to be unsafe, and their life to be very short, due to the inferior quality of the connections and the wires used. Standards should be set up to keep them off the market.

A study of the low-cost mechanical refrigerators on the market shows that under laboratory-test conditions at 90° F., such cabinets with good insulation can maintain satisfactory internal temperatures with current cost of less than 2 kilowatt-hours a day. The tendency is to build the larger models better, and poor construction of some of the small cabinets makes them a poor buy. As

electric refrigerators are now made, current consumption varies little with cabinet size to 6- or 7-cubic-foot food space. It therefore seems better to buy a box of 6 cubic feet or more, if the family purse and the space available for the cabinet will permit.

Our studies also indicate that under test conditions at 90° F. room temperature, a good refrigerator of about 6-cubic-foot food space uses per month about 50 kilowatt-hours of electrical energy, 900 pounds of ice, 12 gallons of kerosene, or 1,800 cubic feet of gas. The test conditions used are such that the mechanical refrigerators maintain an average temperature of 43° F. The ice refrigerators give an average temperature of 53° F. Because of difference in design, both the mechanical and the ice-cooled refrigerators give about 46° F. in the space intended for milk. At lower room temperatures all these values will of course be lower.

ECONOMIC STUDIES

What consumers buy, what proportion of their income they spend for different classes of goods and services, and how adequate those purchases may be for health, comfort, and satisfaction—these questions, considering the fact that the household unit is the chief consumer buyer, are the main concern of the Economics Division. Its studies are intended to give consumers help in improving their standards of consumption, to develop concrete plans for money disbursement, use of time, and resources other than money, so as to promote the consumption standards established and afford a basis for advising consumers as to market selection of goods and services.

In meeting these objectives, the Economics Division has for several years past proceeded along three lines with main emphasis on the first: (1) Studies of the consumption habits and needs of American families, including an appraisal of the economy and nutritional adequacy of diets; (2) the economics of consumer buying; and (3) studies of time spent in household tasks.

CONSUMPTION HABITS AND NEEDS OF FAMILIES

A study of economic and social problems and conditions of the southern Appalachians, in which a number of interested State and Federal agencies have participated cooperatively over a period of 4 years, has included research by this Division on the consumption habits of families of this mountain area. The purpose of the study was to provide a basis for a well-rounded plan of social action to effect increased well-being of the region's people. To the report, published as Miscellaneous Publication 205, *Economic and Social Problems and Conditions of the Southern Appalachians*, this Division made two contributions—a description of the content of living of these farm families and the variations in the different neighborhoods, and an appraisal of their diets.

Findings from the Division's study are of especial interest now when a national program of rural rehabilitation and resettlement is under way. They indicate clearly how badly located land of low fertility may contribute to low living levels throughout large areas. Investigators found that among the Appalachian farm families studied, those who were living comfortably were in fertile areas where good roads, schools, and health services helped to increase their well-being. Most of the families, however, lived under unsatisfactory conditions, due in part to the low productivity of their small farms, which are sloping and have poor soil. Lack of access to markets and limited opportunities for employment by means of which they might supplement their meager returns from farming also are factors leading to low family incomes. In an unproductive farming area where poverty is widespread, it is impossible for the area alone to provide schools, libraries, health units, roads, and other goods and services by means of which general living levels may be raised.

Many of the families studied lacked the training and information needed to help them make the best possible use of what resources they had. The formal education of the homemakers and farm operators was too limited to help them improve the consumption patterns and ways of farming followed by previous generations. Poor roads limit their contacts and thus help to keep them unaware of developments which have increased well-being elsewhere, such as advances in the technics of homemaking, in medicine, and in education. Large families have tended to lower the level of living. The Division's study emphasizes the importance of outside earnings by family members to supplement farm* income in areas such as this which are not well adapted to agricul-

ture. Families of the highest level of living were found to have the largest income from nonagricultural sources.

The Division's extensive investigation of 228 of these southern Appalachian families in Knott County, Ky., furnishes an even better picture of living content than do the two sections of the joint publication, just described. A report, almost ready for press, depicts in detail the ways of living of a group of low-income, rural families whose farms yield little more than is needed for home consumption, annual average sales of farm products being only \$55 per family. Outside earnings averaging \$337 per family supplemented their small incomes. Common to the county were these characteristics: early marriages; numerous children; small frame houses, often overcrowded; lack of toilet facilities, especially at the lowest living levels; absence of modern conveniences, only 4 of the 228 families having water piped to a bathroom and only 25 having electric lights; isolation, only 1.4 percent having autos and the same percentage radios; and low standards of education.

Intensive study of the food consumption of 41 of these Knott County families indicated that many diets could have been made more adequate had the families been more aware of the importance of certain foods for health and had farm production been planned to supply those foods.

Although the low consumption levels prevalent in this mountain county were due in part to geographic location and other factors beyond the control of the individual family, this study indicates that a wisely planned and well-executed educational program could do much to increase family well-being. Cooperating educational agencies plan to make such use of the research report. But its value is not limited to that section alone. Data concerning the living content and money expenditures of these low-income farm families have served as a basis in this Division for the preparation of budgets and other material to be used by educational and welfare agencies working with rural-rehabilitation families in other localities.

Such a broad cooperative research study indicates, too, the need for a comprehensive social program if family well-being is to be achieved. No one agency can solve the problem alone. Thus home-economics education would have to be supplemented by such other social action as special educational programs planned by farm-management specialists to help the farmers make the best possible use of their resources, extension of roads to remote localities, and broad policies in regard to use of land.

The publication, *Studies of Family Living in the United States and Other Countries: An Analysis of Material and Method*, is now in press as Miscellaneous Publication No. 223. This is the first comprehensive bibliography of such studies. In addition to a brief description of the type of information available in each report listed, the authors discuss technics used in gathering and analyzing data on family living. The publication should, therefore, assist in pointing the way to better research on family consumption in the future. It will also be of service to educators and other workers concerned with family well-being, since it will help them to find source material concerning the family living of groups comparable to those with which they work.

Plans have been made for a Nation-wide study of family consumption to be undertaken with other governmental agencies, if funds are available, and the Division has given the time of its members who have been asked to advise with other groups interested in research on national consumption.

An account book is an important tool for improving consumption, since it helps a family to appraise its past ways of spending and to plan so that future expenditures may better serve its needs. This Division, therefore, has long been interested in family accounts, has published a family account book, and has cooperated with extension workers in a Nation-wide study of the forms best adapted for account keeping. This past year, with the cooperation of the home-management specialist of the Federal Extension Service, the Division has issued a simple, rotaprinted farm-home account book, designed especially for use by extension agents helping rural-rehabilitation families.

Since the demand for this book has indicated wide-spread interest in account keeping, it is planned to replace it by a printed farm-household account book better adapted to serve all types of farm families. Recognizing the importance of using such a book in conjunction with a farm account book, help of specialists from the Bureau of Agricultural Economics and the Agricultural Adjustment Administration has been sought in planning the net-worth sheet and other forms to be included. Similar books for the city family and for the individual are being prepared.

The need of families for help in their budgeting problems has been evident in Division correspondence. Families of all income levels, but especially those with reduced incomes, have written for aid in planning budgets so that their money may give them the greatest returns. In meeting these requests, the Division has stressed the importance of obtaining the best possible diet at the lowest possible cost, and has furnished food budgets, menu plans, guides for food buying and, in cooperation with the Food Utilization Section, economical recipes. Suggestions designed to help extension workers plan suitable budgets for rural-rehabilitation families have been set up in tentative form. Budgets have been prepared for specific low-income groups at the request of other Government agencies interested in finding out what levels of living are possible with given incomes.

ECONOMICS OF CONSUMER BUYING

The growing recognition of the importance of consumer buying problems has been reflected in correspondence. The Division has been called on by teachers for help in their consumer-education programs and by housewives wishing to become better buyers. In addition, one member of the Division had a part in the preparation of a bulletin on consumer education for issuance by the Office of Education. So popular has been Miscellaneous Publication 193, *Present Guides for Household Buying*, that the supply has been exhausted, and this Division has cooperated with the Division of Textiles and Clothing in its revision. It also has contributed to the work of other governmental agencies working with consumers' problems.

